Appendix III:
Guideline for Identification of Best Available Control Technology - Economically Achievable (BACTEA)

1.0 Introduction

The proposed Industry Emissions Reduction Plan (Industry ERP) includes a provision for new and expanding sources to be a part of the emissions trading system. It also proposes that these emission sources should receive an allocation of allowances to help them establish or expand operations in Ontario. As a way to arrive at an allocation for such sources, the Ministry proposes to base the allocations on the emission levels that would correspond to the installation of Best Available Control Technologies - Economically Achievable (BACTEA).

These proposed BACTEA requirements ensure that proponents consider all available alternatives, and select the best available NO_X/SO_2 control technology[1] as the basis for allocations from the New Source Set Aside (NSSA). Furthermore, it provides a step by step process for facilities to justify the selection of comparable emissions control technology.

The purpose of this Policy Guideline is to provide guidance on how to apply the BACTEA requirement to either new or expanding manufacturing facilities entering the emission trading system. The BACTEA determination is applicable only to the new equipment. The determination consists of two main parts - (1) assessment of technical feasibility and (2) application of economic achievability ranking criteria. Facilities must present their analysis of all potential BACTEA technologies to the Ministry of the Environment, including the application of an economic achievability ranking system. The Ministry will base each proponent facility's NSSA allocation on the emissions it would produce if it had installed BACTEA equipment. The proponent facilities may install whatever equipment they wish, but the facilities must comply with the requirements of the Industry ERP (i.e., at the end of every year they must surrender sufficient allowances to offset all NO_X and SO_2 emissions).

In no event shall any BACTEA determination permit the proponent to violate the requirements of any applicable regulation, standard or guideline.

BACTEA Defined

The US EPA pioneered the BACTEA determination process for use in the Clean Air Act and other regulations.

"The term "best available control technology" means an emission limitation based on the maximum degree of reduction of each pollutant subject to regulation under this Act emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems, and techniques, including fuel cleaning, clean fuels, or treatment or innovative fuel combustion techniques for control of each such pollutant. In no event shall application of "best available control technology" result in emissions of any pollutants which will exceed the emissions allowed by any applicable standard established pursuant to section 111 or 112 of this Act."

from 1990 Clean Air Act. Title 1, Part C, Subpart 1, Section 169 (2) (C)

[1] In this document, technology may be taken to mean either one distinct piece of equipment or a combination of pieces of equipment meant for one distinct purpose.

2.0 BACTEA Evaluation

The BACTEA evaluation requires a case-by-case analysis that is prepared by the proponent. The proponent should complete a BACTEA evaluation for each distinct new process that produces emissions. The steps in the evaluation are as follows:

1. Identify All Potential Control Options for Pertinent Industry and Process.
2. Eliminate Technically Infeasible Options
3. Rank Control Technologies by Effectiveness
4. Evaluate Control Costs
5. Select BACTEA
6. Submit BACTEA Results and Documents to the Ministry of the Environment (MOE)
7. MOE Reviews BACTEA Submission
8. MOE Determines Allocation and Informs Proponent

Additional details on each step follow below.

Step One: Identification of Control Technologies

The proponent must identify **all** available control technologies with potential for application to all the NO_X and SO_2 emitting processes that are a part of the project, except equipment with a maximum input less than 1,000,000 Btu/hour. This list should include technologies for production process, methods, systems, process changes and pollution prevention techniques for control of the pollutant.

The following is a perfunctory list of examples of potential control options:

- process controls or changes
- source reduction
- add-on abatement equipment
- good engineering practices.

Step Two: Elimination of Technically Infeasible Options

The proponent must review the control technologies and eliminate any technically infeasible options.

The submission to the MOE must include all physical, chemical, engineering principles, and technical difficulties that demonstrate the technical infeasibility of the control options that the proponent claims are infeasible. Furthermore, the proponent must submit all supporting information, including the technologies' reduction efficiencies (i.e., per cent of pollutant removed) and compatibilities with existing equipment (if the application is in response to a proposed expansion).

Step Three: Ranking of Technically Feasible Control Technologies by Effectiveness

The proponent must establish a hierarchy of technically feasible control options ordered from highest to lowest control efficiency (per cent of pollutant(s) removed relative to uncontrolled emissions). This ranking must form a part of the proponent's submission to the MOE (see below).

Control efficiency is the primary criterion, but proponents should also document the expected emission reductions from uncontrolled processes the various technologies may achieve.

If the application is in regard to a new facility, then the proponent may base its estimate of uncontrolled emissions on anticipated facility throughput. If the proponent is applying for allowances for either a modification or a plant expansion, then it should include output, capacity usage and emissions from the prior five years and use those as the basis for estimating the emissions that the new equipment would cause if left uncontrolled.

The proponent may choose a representative reference year, with justification for this choice. For example, the proponent may propose to multiply the new production equipment's throughput capacity by the facility's historical average capacity utilization to arrive at a reference year throughput rate for the new equipment. Facilities could then refer to this year to develop their estimated emissions from the new equipment, and the emission intensity applicable to the new equipment, if desired.

The proponent can determine achievable performance by referencing manufacturers' data, engineering estimates, historical performance data and technology reviews performed by either the US EPA or some branch of the European Union or one of its member countries. The proponent may use other review data as it wishes, if it provides proof of the validity and rigour with which these evaluations have been executed. If the proponent chooses to use manufacturers' data in its determination, it should ensure that the manufacturer guarantees these data. The proponent must present proof of this guarantee. If the proponent does not present such proof, the MOE will reject its application and it will not receive an allocation from the NSSA.

Submission Requirements

In its submission, the proponent should include the following information:

1. Expected emission control efficiency (tonnes /year)
2. Emissions performance level (e.g., per cent of pollutant removed, emissions/unit of product, where possible)
3. Planned production increase, total current production and estimated future production.

The proponent may skip directly to Step Five if it wishes to select the control option that is ranked first after this step as its BACTEA.

Step Four: Evaluating Control Costs

4.1 Estimating Control Costs

The proponent must specify the parameters of the control option before estimating the costs (using vendor-supplied design parameters).

To estimate the cost of the control, the proponent must first specify the limits of the process (i.e., control system battery limits). Next, the proponent must list the cost of

each major piece of equipment. The proponent must document all relevant costs. Vendor quotations and other reliable means should form the primary basis for the estimates. Proponents should refer to the methods outlined in the most recent United States Environmental Protection Agency's (US EPA) Office of Air Quality Planning and Standards Control Costing Manual or the US EPA's Draft New Source Review Workshop Manual for examples of reliable methods. The proponent must note the base year of all cost estimates and adjust, likely by discounting, all other calculations to reflect the base year.

The proponent must annualize the capital cost of each piece of control equipment over its useful life, using the long-term bond rate.[2]

The proponent must add annual operating and maintenance costs associated with operation of each control option to the annualized capital cost derived in the previous step to arrive at the **annual control cost** associated with each control option. Please refer to Appendix One for instructions on how to calculate annualized costs.

4.2 Evaluating Cost Efficiency

The primary cost evaluation consideration is cost efficiency. Once the proponent has the annual control costs using varying technologies, it can determine the cost efficiency (in dollars per tonne) of each control option by dividing its annual control cost given in dollars per year by its expected emissions rate given in tonnes per year. These cost efficiency figures, and the control efficiency figures determined in Step Three are used in the Selection of Best Available Control Technology, Step Five (below).

Step Five: Selection of Best Available Control Technology

The Director will base the proponent's allocation from the NSSA upon the most effective control option (i.e., highest control efficiency, determined in Step Three).

The Ministry considers technologies to be comparable if their removal efficiencies do not differ by more than 15 per cent.[3]

If the top three (3) most efficient control technologies are comparable, the proponent may ask the Director to base its allocation on the most *cost* efficient (i.e., lowest cost per tonne removed, determined in Step Four) control technology selected from the top three most effective emissions *control* technologies.

The proponent's BACTEA proposal submission should include:

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[2] In effect, this means that the proponent must model the cost of the equipment as if its purchase is financed out of debt, with an interest rate equal to the long term bond rate in effect at the time the analysis is undertaken.

[3] For example, if the technology with the highest removal rate eliminates 98 per cent of NO_X from an exhaust stream, then a comparable technology would not remove less than 83 per cent (98 - 15 = 83) of NO_X from the same exhaust stream.

1. The emission reduction option(s) chosen to be BACTEA
2. A detailed description of the emissions reduction method/equipment offered as BACTEA, and all control options that have higher removal efficiencies than the proposed BACTEA.
3. All supporting information, including the list of technologies identified in Step One and the rationale for elimination of those that eliminated in Step Two.
4. References to US Environmental Protection Agency's RACT/BACT/LAER Clearinghouse or European Union's BACT databases, where possible.
5. Company information, Certificate of Approval Information (if available), and the industry-level North American Industrial Classification System code pertinent to the facility.
6. A description of the production equipment, including equipment rating and size.
7. General/Identification info (name, address, tel, fax, manager name, etc.).
8. Description of processes and products.
9. Emission-related info (pollutant info, points of emissions, emissions rate, fuel requirements, control equipment, monitoring, stack height limits, costs, etc.).

Confidential application information should clearly be marked as such.

Step Six: Submit BACTEA Determination Results

The proponent must send the BACTEA Determination results, including all the documentation listed above, to the Ministry of the Environment at the following address:

Ministry of the Environment
Industry ERP - NSSA BACTEA Determination
c/o Air Policy and Climate Change Branch
135 St. Clair Avenue West, 4th Floor
Toronto, Ontario
M4V 1P5

Step Seven: Ministry Reviews BACTEA Determination

Upon receipt of a proponent's proposed BACTEA determination for NSSA purposes, the Ministry will confirm receipt of the package and inform the proponent if there are any outstanding items.

Once all items sufficient for application review are in the possession of the Ministry, it will review the quality and validity of the proponent's claims.

If the Ministry determines that the proponent's application is deficient, implausible or otherwise inadequate to support the selection of the proposed technology as BACTEA, it will inform the proponent of the inadequacy of its submission and return the submission package to the proponent. In such an instance, the proponent will be required to amend its BACTEA determination and resubmit it to the Ministry. It is in the proponent's best interest to ensure that the original submission is comprehensive and that claims therein are valid, as the proponent will be required to comply with the Industry ERP regulations regardless of the status of its application for NSSA allowances.

If the proposal is in order and the Ministry agrees with the proponent's choice of BACTEA, the Ministry will use this technology as **the basis of its allocations to the proponent** from the NSSA. Please refer to Industry Emissions Reduction Plan for more information on allocations and new sources.

Addendum One - Cost Calculations

Calculating Costs
1. Capital Costs For the purposes of this guideline, total annual cost (TAC) has three elements: direct costs (DC), indirect costs (IC) and recovery credits (RC). The following equation expresses the relationship between these elements: TAC = DC + IC - RC Direct Costs: costs of equipment, taxes, labour, site preparation, installation, etc. Vendors can usually supply these costs. Indirect Costs: costs that the proponent would incur even if the system were shut down. An example of indirect cost would be overhead costs (e.g., property taxes, insurance, etc.) Also includes one time costs such as engineering, performance tests, etc. Recovery Credits: the materials or energy recovered by the control system that are sold, recycled into the process or reused on site. Note: the proponent should not consider the cost of land as a part of the cost of the control technology.

General Annualization Formula
TAC = [(O&M - SAV) x (1-T)] + [(K x (I/(1 - (I+1)-n)) x (1 - T)] - [REV x (1 - T)] TAC = total annualized cost O&M = operating and maintenance costs SAV = cost savings T = income tax rate K = capital cost I = long-term bond rate n = life of abatement equipment or system REV = revenues from by-products or co-product sales where T = 0, TAC represents the "before tax" net cost which is also the cost to society; and where T > 0, TAC represents "after tax" cost which is borne by the polluter.